Water Resource Information and Assessment Report for the Great Lakes Inventory and Monitoring Network

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EXECUTIVE SUMMARY

This report was prepared to meet the policy and regulatory portion of the water resource information and assessment needs of the Great Lakes Network (GLKN). National Park Service (NPS) mandates pertaining to water quality and water quality standards of the four network states--Indiana, Michigan, Minnesota, and Wisconsin--were reviewed and summarized. Other materials reviewed include park "Baseline Water Quality Data Inventory and Analysis" reports, available park resource management reports, Internet websites for state lists of impaired water bodies (303(d) lists), the Great Lakes Agreement, and NPS.

Water is a major natural resource of the nine GLKN parks, and NPS mandates clearly state the need to protect water resources. The NPS Strategic Plan 2001-2005 provides goals and guidelines for water quality (NPS 2001). In the Omnibus Management Act of 1998, Congress required that park managers provide a "program of inventory and monitoring of the National Park System resources."

The majority of the nine Network parks exhibit generally good water quality (Table 1). However, the amount of historic water quality data available for each park varies widely, which makes comparisons difficult. Atmospheric deposition and surrounding land use practices are two of the most common threats to water quality in the nine parks. Three of the parks (Indiana Dunes National Lakeshore, Mississippi National River and Recreation Area, St. Croix National Scenic Riverway) are located in more urban settings and have been negatively impacted by residential and industrial anthropogenic activities. Seven of the parks have one or more water bodies listed in the corresponding state 303(d) list of impaired water bodies because of air deposition of toxics and land use practices. On the other hand, six of the parks enclose water bodies considered to be Outstanding Resource Waters (ORW) by the corresponding state.

Regulations for the maintaining water quality in GLKN parks include Water Quality Standards in Minnesota, Wisconsin, Michigan, and Indiana. All but two of the parks are located in the Great Lakes Basin and fall under the Great Lakes Water Quality Agreement between the United States and Canada. The NPS can be assured that water quality is being maintained and meeting applicable criteria in the GLKN parks by characterizing and monitoring water quality.

Water quality monitoring is an important part of water resource management and protection. A standardized monitoring plan for Network parks, using core parameters recommended by the NPS Water Resources Division, would be useful in tracking overall water system health and should be compatible with outside sampling by states and other agencies. At the same time, the diversity among the parks and variety of impacts to each dictates customized monitoring to more fully document water quality.

Table 1. Summary of threats to water resources at the nine National Park Service units in the Great Lakes Inventory and Monitoring Network

Park	State	Data	Threats to water resources	Documented problem parameters*	Waterbody legal status
Apostle Islands National Lakeshore (APIS)	WI	1968-1996	Appears to be good quality. Atmospheric deposition and water traffic/recreational use. Highly erodible soils and often severe spring runoff.	None documented	None designated
Grand Portage National Monument (GRPO)	MN	1968-1995	Appears to be good. Relatively little water quality data. Atmospheric deposition, recreational use, wastewater, runoff, and surrounding landuses of mining and logging.	None documented	303(d) listed waters
Indiana Dunes National Lakeshore (INDU)	IN	1935-1992	Impacted by industrial/municipal effluents, surface runoff, sulfur and nitrous oxides, altered hydrologic processes, exotic species, and drain and fill of wetlands.	PCBs, PAHs, metals, pesticides, fuels and oils, indicator bacteria, biota	OSRW waters 303(d) listed waters
Isle Royale National Park (ISRO)	MI	1962-1987	Appears to be very good quality. Atmospheric deposition, visitor activities, and waste.	Mercury, PCBs	303(d) listed waters Whole park OSRW
Mississippi National River and Recreation Area (MISS) [+]	MN	1926-1994	Heavily impacted by industrial/municipal waste water discharges, stormwater runoff, commercial and residential development, contaminated sediments, and erosion.	Dissolved oxygen, metals, indicator bacteria	303(d) listed waters Headwaters ORW
Pictured Rocks National Lakeshore (PIRO)	MI	1968-1984	Appears to be good quality. Atmospheric deposition, surrounding land use practices and development, invasive species, and viewshed impacts.	None documented	303(d) listed lake Whole park ORW
St. Croix National Scenic Riverway (SACN)[+]	WI	1926-1995	Impacted by development, industrial/municipal wastewater discharges, surface runoff, agriculture, cranberry industry, and recreational use.	Dissolved oxygen, metals, indicator bacteria	ORW rivers 303(d) listed lakes and flowages on the rivers
Sleeping Bear National Lakeshore (SLBE)	MI	1962-1996	Appears to be good quality. Septic leakage, wastewater, runoff, and recreational use.	None documented	303(d) listed lakes Whole park OSRW
Voyageurs National Park (VOYA) [+]	MN	1967-1991	Appear to be of good quality. Atmospheric deposition, human use and adjacent landuses. Naturally occurring low yield aquifers may limit groundwater use.	Mercury, PCBs, fuels, waste water	Whole park ORW

*Denotes historic data gathered in "Baseline Water Quality Inventory and Analysis Reports".

# Denotes Water Quality Standards and state lists

[+] Park not in Great Lakes Basin

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INTRODUCTION

This report was prepared to meet the policy and regulation portion of the water resource information and assessment needs for the Great Lakes Network (GLKN). Simultaneously, National Park Service (NPS) staff reviewed available fisheries, aquatics, and toxicology data. The combined gathered data will assist park and Network staff and collaborators in determining the aquatic resources monitoring needs for GLKN parks.

There are nine GLKN parks. The Apostle Islands National Lakeshore (APIS), Grand Portage National Monument (GRPO), Isle Royale National Park (ISRO), and Pictured Rocks National Lakeshore (PIRO) are located along Lake Superior shores. Sleeping Bear Dunes National Lakeshore (SLBE) and Indiana Dunes National Lakeshore (INDU) are located along the shores of Lake Michigan. The Saint Croix National Scenic Riverway (SACN) and the Mississippi River National River and Recreation Area (MISS) are located inland near the border of Wisconsin and Minnesota.

The parks' geographic locations and water resources vary considerably. For example, the Mississippi National River and Recreation Area boundary encompasses 54,000 acres of river and surrounding land as the river runs 72 miles through a metropolitan area. The 15,000-acre Indiana Dunes National Lakeshore stretches along industrial southern Lake Michigan. More than 30 lakes are located in Voyageurs National Park; most of its 55-mile northern border is through Rainy Lake between Canada and Minnesota. This great diversity in land mass, surrounding land use and water resources demands flexibility in water resource monitoring and management. See "Baseline Water Quality Inventory and Analysis" reports for more information on each park (NPS 1994, 1995a, 1995b, 1995c, 1995d, 1995e, 1997, 1998, 1999a, 1999b).

METHODS

NPS mandates pertaining to water quality and water quality standards of the four GLKN states were reviewed and summarized. The park "Baseline Water Quality and Data Inventory and Analysis" reports, available park resource management plans, and Internet websites for the State 303(d) lists, the Great Lakes Agreement, and the NPS were also reviewed.

This report makes general recommendations for future monitoring of the water resources of GLKN parks. Further study of each individual park and its needs is necessary before a complete monitoring plan can be written.

The original intent of this contract was to create a database of water quality criteria for all parameters included in water quality standards by states where Network parks are located. However, during the course of work on this task, the contractor and Network staff determined that a database of combined state water quality standards would be too complex in this phase. Each state has adopted its own designated uses, table format, and criteria applications. Two states have separate sets of criteria for Great Lakes Basin and non-Basin waters. The states do not have their own standards in database form for use in data comparisons (Pfeiffer, D. USEPA Region V Water Quality Standards Coordinator, personal communication, February, 2003). The NPS "Baseline Water Quality Inventory and Analysis" reports used federal guidance in screening historic water data instead of state water quality criteria. Therefore, it is recommended that the Network use the federal guidelines criteria as the interim screening criteria and create a more complete database in the future (Tucker, D. NPS WRD, personal communication, February, 2003). The contractor obtained the Access file of the federal criteria from the NPS Water Resources Division (WRD) entitled "NPS Water Quality Criteria Screens for New and Legacy STORET." Appendix A contains an abbreviated version of this Access file created in Microsoft Excel and transferred to Microsoft Word.

RESULTS AND DISCUSSION

National Park Service Mandates

National Park Service (NPS) enabling legislation, the 1916 Organic Act (NPS 1916), directed the NPS to work "within the established water regulatory system while preserving the scenery, natural and historic objects and wildlife, and provides for the enjoyment of same in ways that leave them unimpaired for future generations."

The National Parks Omnibus Management Act (NPS 1998) provides a research mandate for the National Parks "…to assure that management …is enhanced by the availability and utilization of a broad program of the highest quality science and information." It also mandates "a program of inventory and monitoring of the National Park System resources to establish baseline information and provide information on the long-term trends in (resource) condition…"

In 1999, the NPS approved the Natural Resource Challenge (NPS 1999c), which stated, "The protection of National Park waters, watersheds, and aquatic life is fundamental to maintaining the integrity of natural resources and the quality of the visitor experience in the parks. A consistent approach to identifying and measuring progress toward meeting water quality standards is essential. Protective standards, scientific monitoring, and a program to ensure the protection of water quality, natural flows, and the health of aquatic systems are required to measure and protect this critical environmental component."

The NPS Strategic Plan 2001 to 2005 sets the following goals for the NPS system to meet by September 2005:

- 85% of 265 park units will have unimpaired waters
- 80% of 265 parks with significant natural resources will have identified their vital signs for natural resource monitoring
- the NPS will acquire or develop 87% of the outstanding data sets (identified in 1999) of basic natural resource inventories for all parks
- complete assessment of aquatic resource conditions in 265 parks

Previous Government Performance and Results Act (GPRA) water quality goals targeted "swimmable beaches." The strategic plan extended that goal to preventing the deterioration of the highest quality waters and improving the quality of the most degraded NPS waters. Historically, availability of water quality data for the parks has been inconsistent due to the variety of agency and state efforts and protocols. The NPS goal is to rely on its own uniform monitoring data and use it to protect this vital resource.

State Water Quality Standards

Under the Water Quality Act of 1965, each state is required to develop water quality standards to achieve water quality goals for interstate waters. The Federal Water Pollution Control Act Amendments of 1972 (also known as the Clean Water Act) established the National Pollutant Discharge Elimination System (NPDES), which requires each point source discharger to waters of the United States to obtain a discharge permit. These amendments also extended the water quality standards program to intrastate waters, required the establishment of technology-based effluent limitations for NPDES permits, and required permits to be consistent with applicable state water quality standards. The original intent of this legislation was to protect water quality and improve polluted United States waters to at least "fishable and swimmable" quality.

Water quality standards are the basis for a water quality-based approach to pollution control and are a fundamental part of watershed management. The basic components of water quality standards are the designated uses defining the goals for a water body, numeric criteria adopted or established to protect the uses, antidegradation policy to protect existing uses and high quality waters, and implementation policy. States must consider public drinking supply, fish and aquatic life, agriculture, industrial and navigation uses, and other needs when designating water body uses. The federal guidelines provide policy and implementation guidance to protect uses that states must meet. Section 303(c) of the Clean Water Act

established the basis for the current water quality standards program, including oversight of state standards by the Environmental Protection Agency (EPA).

Concern that states were relying too much on narrative criteria for control of toxics (e.g., "no toxics in toxic amounts") led to the Water Quality Act of 1987. These amendments to the Water Quality Act required states to identify waters that do not meet water quality standards, adopt numeric criteria for pollutants in such waters, and establish effluent limitations for individual discharges to such water bodies. These amendments also explicitly recognized the EPA's antidegradation policy to protect the level of water quality necessary to sustain existing uses and provide a means for assessing the need for developments that may lower water quality in high quality waters.

The 1987 Amendments, under Section 518 of the Clean Water Act, authorized the EPA to treat tribes as states, thus enabling tribes to write their own water quality standards for reservation waters. The EPA approves these tribal standards. By the year 2000, only a few tribes had successfully adopted water quality standards, and the EPA explored the promulgation of Core Standards for tribes. The measure has been put on hold, and, as of this writing, has not been carried out. The Grand Portage National Monument bisects the land of the Grand Portage Band of Chippewa Indians. The tribe is currently working on water quality standards. The EPA may approve these standards in 2004 (Newport, R. USEPA Region V, personal communication, 2003). The St. Croix Band of Chippewa Indians, whose reservation is adjacent to the St. Croix National Scenic Riverway, is also developing water quality standards at the time of this writing.

Under Section 305(b) of the Clean Water Act, each state is required to conduct water quality surveys to determine the overall health of the waters of the state, including whether or not designated uses are being met. States report to the EPA every two years. When impaired water bodies are identified through 305(b) assessments, they are included in 303(d) lists for ranking of priority sites and Total Maximum Daily Load (TMDL) development in order to limit discharges of specific pollutants to that water body.

For watershed basins within the Great Lakes watershed, states must follow the Great Lakes Initiative (40 CFR 132) when adopting water quality standards. Overall, states must adopt standards and criteria that are at least as stringent as EPA guidelines. Water quality standards include procedures to document a need for numeric criteria that are more stringent than the EPA's for a particular constituent and methods for determining the value of new criteria. Only after these procedures have been satisfied will a site-specific numeric criteria be accepted.

State Water Quality Standards for the four GLKN states are summarized in Appendix B. Appendix C contains information on the water bodies located within each park that are designated as Outstanding Resource Waters (ORW) and/or listed in 303(d) by the corresponding state. ORW designation by a state is an antidegradation policy determination, which signifies that no lowering of water quality is allowed for that specific high quality water body.

The Great Lakes Water Quality Agreement

The Great Lakes Water Quality Agreement (GLWQA), first signed in 1972 and renewed in 1978 and 1987, expresses the commitment of the United States and Canada to restore and maintain the chemical, physical, and biological integrity of the Great Lakes Basin ecosystem. A number of objectives and guidelines for meeting those goals are defined in the document. The GLWQA reaffirms the rights and obligations of Canada and the United States under the Boundary Water Treaty. Annexes address a variety of issues such as atmospheric deposition of toxic pollutants, contaminated sediments, groundwater, and non-point sources of pollution. Areas of the Great Lakes that do not meet water quality objectives defined in Annex 1 (Appendix D) are listed as Areas of Concern (AOC; http://www.epa.gov/glnpo/aoc/grandcal.html). The GLWQA includes the development and implementation of Remedial Action Plans (RAP) for AOC. Lakewide Management Plans limit the total release of chemicals determined to be critical to the health of the Great Lakes. For example, the nine Critical Pollutants targeted for virtual elimination from Lake Superior are: mercury, polychlorinated biphenyls (PCBs), dieldrin/aldrin, chlordane, dichloro-diphenyl-trichloroethane

(DDT) and its metabolites, toxaphene, 2,3,7,8-tetrachloro-dibenzo-p-dioxin (2,3,7,8-TCDD), hexachlorobenzene, and octachlorostyrene.

None of the GLKN parks are located within an AOC. Indiana Dunes National Lakeshore is, however, directly adjacent to the Grand Calumet River AOC. The AOC begins 15 miles south of downtown Chicago and includes the east branch of the river, a small segment of the west branch, and the Indiana Harbor and Ship Canal (EPA 2001). The east branch of the river is located at the extreme west end of Indiana Dunes National Lakeshore. This branch of the river has been modified by area industry and no longer enters Lake Michigan at this point. Instead, it flows west, toward Gary and away from the National Lakeshore. It enters Lake Michigan at the Indiana Harbor (Grand Calumet Task Force 2002).

Baseline Water Quality Data Inventory and Analysis Reports

The Baseline Water Quality Data Inventory and Analysis reports, also called the "Horizon" reports, are summarized in Appendix E. The Executive Summaries for each report will be archived in the GLKN office. The reports summarize historical data retrieved from several sources including STORET, the EPA's data Storage and Retrieval System, for a study around each park. The amount of data available for each park varied from 25 to 70 years of historical data. "Baseline" data in water chemistry usually refers to data gathered over several years of sampling to portray natural temporal and seasonal variations. The data available in these reports may not constitute "baseline" data for each park. Some parks had very little data available from within the park. In others, the data were sporadic or represented a one-time sampling event at a particular site. (Please note that these reports were reviewed and summarized by the contractor at the summary level for this report and that the collected data was not itself critically analyzed.)

Clean Water Action Plans

Under the 1998 Presidential Clean Water Action Plan (CWAP), each state was required to prepare Unified Watershed Assessments for watersheds at the 8-digit Hydrologic Unit Code (HUC) level. The 8-digit HUC signifies the smallest geographical drainage division used currently by the United States Geological Survey (USGS) to divide the nation into water basins. Each watershed was rated according to the following scale: Category I "Watersheds In Need of Restoration," Category II "Watersheds Meeting Goals," Category III "Watersheds with Pristine or Sensitive Aquatic System Conditions on Lands Administered by Federal, State, and Tribal Governments," or Category IV "Watersheds with Insufficient Data to Make an Assessment." The objective was to get a "snap shot" look at those water bodies requiring restoration and to obtain funding for those needs. All involved agencies and tribes were to contribute to the documentation to create a unified assessment. All available sources of information, including 305(b) reports and 303(d) lists, were to be used in the assessments. Wisconsin, Minnesota, and Indiana Unified Watershed Assessments were in good general agreement with the Horizon reports' findings as to watershed impacts and status, but the geographical scale was different. The Michigan assessment was less than helpful as all watersheds in the state were listed as Category I with little information that could be interpreted at the park level. Table 2 lists the nine parks, their major HUC code, and relevant state CWAP categorization.

TABLE 2. Great Lakes Network Parks and major watershed summary

Park name	Park code	Major watershed	HUC code	CWAP category
Apostle Islands National Lakeshore	APIS	Lake Superior	4020300	II
Grand Portage National Monument	GRPO	Baptism-Brule	4010101	I
Indiana Dunes National Lakeshore	INDU	Little Calumet-Galien	4040001	I
Isle Royale National Park	ISRO	Lake Superior	4020300	I
Mississippi R. Nat'l River and Recreation Area	MISS	Twin Cities	7010206	I
Pictured Rocks National Lakeshore	PIRO	Betsy-Chocalay	4020201	I
Saint Croix National Scenic Riverway	SACN	Lower St. Croix Upper St. Croix Namekagon	7030005 07030001 07030002	II
Sleeping Bear Dunes National Lakeshore	SLBE	Betsie-Platte	4060104	I
Voyageurs National Park	VOYA	Rainy Lake	9030003	II

RECOMMENDATIONS

According to NPS mandates and policy, parks must characterize and monitor water quality and plan for the protection of their water resources. Ground water was not specifically studied for this report, but it is connected to surface water and wetlands and should not be overlooked as a resource. The completeness of historic water data for each GLKN park varies widely. The parks themselves are very diverse; threats to water quality differ among the parks (e.g., ISRO vs. MISS).

The NPS Freshwater Workgroup Subcommittee draft recommendations (NPS 2002) include five core parameters considered necessary for the Vital Signs program: water column temperature, specific conductance, pH, dissolved oxygen (DO), and some documentation of flow. These parameters are general indicators of water system health, inexpensive tests, and important field study information useful for the interpretation of other studies. Standardization of water quality monitoring at this level will enable data sharing and comparison among parks and with other jurisdictions. Water quality monitoring using these parameters is achievable through the use of commercially available multiprobes for direct reading measurements in surface water. Other useful parameters that should be considered and can be added to the probe include chlorophyll A and chloride.

Chemical, physical, and biological data are all important in characterizing water ecosystem health as these aspects are inter-related. Chemical data require flow data for load calculations. Biological communities depend on dissolved oxygen in a stream. Erosion of stream banks can alter water chemistry and habitat. Macroinvertebrate or zooplankton monitoring are examples of programs that yield data on long-term water quality. Physical monitoring of a stream is important to understanding its dynamics. Indicators must be chosen that provide the information necessary to the monitoring objective (Irwin 2002, NPS 2002).

Once a month samplings with occasional "storm chasing" (high flow sampling) can be used to estimate the annual variation in basic chemistry of most water bodies. Seasonal samplings are also common. The USGS and the Intergovernmental Task Force on Monitoring (ITFM) recommends long-term monitoring to characterize water quality and analyze trends (ITFM 1995, USGS 2001). The USGS National Water Quality Assessment program sampling networks are set up so that periods of intensive sampling for three to four years alternate with seasonal or biennial sampling for six years. This method provides long-term data and, at the same time, considers budget constraints.

GLKN park sampling sites should be determined on an individual park basis, but sampling sites should include major points of entry to the park, sites of impact within the park (wastewater discharge, public use),

and downstream sites. A water quality-monitoring plan of this type would help the NPS document water characteristics, identify potential threats, assess impacts, and document whether park management is maintaining the quality of water resources.

Additionally, parks with water bodies that are threatened by a specific activity and/or have historically shown detections of contaminants should periodically sample for those constituents (ITFM 1995). Budget constraints and seasonal variations will ultimately determine a sampling schedule. Some GLKN parks have been impacted by municipal or private wastewater discharges (Table E1). Waters in those areas should be monitored for indicator bacteria. Non-point source pollution is a major threat to water quality in both urban and rural areas. Agriculture, forestry, construction, residential development, and roads all contribute to non-point source pollution. Therefore, parameters such as phosphate, nitrate, chlorophyll A, and turbidity may be important to a park-monitoring program.

Atmospheric deposition of various types negatively affects Network parks, and air quality trends in the region should be considered. Mercury and polychlorinated biphenyls (PCBs) should be included in a monitoring plan for parks affected by air deposition of these toxics. Other air quality information and water quality monitoring parameters may be necessary at a park (e.g., INDU) affected by local industrial facility discharges.

Monitoring plans are often very complex and should include data quality objectives, standard operating procedures, quality assurance project plans, the collection of associated data to meet data requirements of the NPS database (e.g., STORET requires metadata), and training of personnel responsible for taking water samples (Irwin 2002). Many parameters will require laboratory analysis. Commercial laboratories provide bottles, chain of custody forms, basic instructions, and shipment coolers along with analytical costs, which can help improve the efficiency of a sampling project.

States require similar laboratory protocols as established by federal guidelines. (For example, “The analytical procedures used as methods of analysis to determine the chemical, bacteriological, biological, and radiological quality of waters sampled shall be in accordance with 40 CFR 136, Standard Methods for Examination of Water and Wastewater, or methods approved by the commissioner,” IN WQS, 327 IAC 2-1.5-10.) Some coordination with outside entities such as state natural resource departments or USGS project sites would enable data compatibility. The NPS core set of parameters is the most widely monitored parameters useful to the interpretation of overall system health, and they are consistent with states and other agencies.

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APPENDIX A: NPS STORET water quality criteria screening values

CAS No	Old Storet	Search name	DW	FW	MW	Other	OtherHII	Units
50293	9786	DDT-P,P'		1.1	0.13			UG/L
50293	214	DDT		1.1	0.13			UG/L
50328	48	BENZO(A)PYRENE	0.2					UG/L
56235	82	CARBON TETRACHLORIDE	5	35200	50000			UG/L
56382	358	PARATHION		0.065				UG/L
57125	146	CYANIDE	200	22	1			UG/L
57749	99	CHLORDANE	2	2.4	0.09			UG/L
58899	294	BHC-GAMMA (LINDANE)	0.2	0.95	0.16			UG/L
58902	1613	TETRACHLOROPHENOL, 2,3,4,6-			440			UG/L
60571	192	DIELDRIN		0.24	0.71			UG/L
67663	115	CHLOROFORM	80	28900				UG/L
67721	267	HEXACHLOROETHANE		980	940			UG/L
71432	46	BENZENE	5	5300	5100			UG/L
71556	502	TRICHLOROETHANE, 1,1,1-	200		31200			UG/L
72208	225	ENDRIN	2	0.086	0.037			UG/L
72435	305	METHOXYCHLOR	40					UG/L
72548	9784	DDD-P,P'		0.6	3.6			UG/L
72548	210	DDD		0.6	3.6			UG/L
72559	9785	DDE-P,P'		1050	14			UG/L
72559	212	DDE		1050	14			UG/L
75014	523	VINYL CHLORIDE	2					UG/L
75092	311	DICHLOROMETHANE	5					UG/L
75252	63	BROMOFORM	80					UG/L
75274	174	DICHLOROBROMOMETHANE	80					UG/L
75354	179	VINYLIDENE CHLORIDE	7					UG/L
75990	820	DICHLOROPROPIONIC ACID, 2,2-	200					UG/L
76017	1436	PENTACHLOROETHANE		7240	390			UG/L
76448	262	HEPTACHLOR	0.4	0.52	0.053			UG/L
77474	266	HEXACHLOROCYCLOPENTADIENE	50	7	7			UG/L
78591	280	ISOPHORONE		117000	12900			UG/L

APPENDIX A (continued)

CAS No	Old Storet	Search name	DW	FW	MW	Other	OtherHII	Units
78875	183	DICHLOROPROPANE, 1,2-	5					UG/L
79005	503	TRICHLOROETHANE, 1,1,2-	5					UG/L
79016	504	TRICHLOROETHYLENE	5	45000	2000			UG/L
79345	485	TETRACHLOROETHANE, 1,1,2,2-			9020			UG/L
83329	2	ACENAPHTHENE		1700	970			UG/L
85007	953	DIQUAT DIBROMIDE (REGLONE)	20					UG/L
85018	366	PHENANTHRENE, C1-C4		30	7.7			UG/L
87683	265	HEXACHLOROBUTADIENE		90	32			UG/L
87865	423	PCP, PENTACHLORO-PHENOL	1	19	13			UG/L
88857	216	DNBP, 4,6-DINITRO-2-SEC-BUTYLPHENOL	7					UG/L
91203	319	NAPHTHALENE		2300	2350			UG/L
92875	47	BENZIDINE		2500				UG/L
93721	447	SILVEX	50					UG/L
94757	547	2,4-D	70					UG/L
95501	170	DICHLOROBENZENE, O-	600					UG/L
95578	117	CHLOROPHENOL-2		4380				UG/L
95954	506	TRICHLOROPHENOL, 2,4,5-		100	240			UG/L
96128	209	DBCP, 1,2-DIBROMO-3-CHLOROPROPANE	0.2					UG/L
98953	326	NITRO-BENZENE		27000	6680			UG/L
100414	232	ETHYL BENZENE	700	32000	430			UG/L
100425	471	STYRENE	100					UG/L
103231	704	BIS(2-ETHYLHEXYL)ADIPATE	400					UG/L
105679	194	DIMETHYLPHENOL, 2,4-		2120				UG/L
106467	172	DICHLOROBENZENE, PARA-	75					UG/L
106934	166	ETHYLENE DIBROMIDE (EDB)	0.05					UG/L
107028	7	ACROLEIN		68	55			UG/L
107062	177	DICHLOROETHANE, 1,2-	5	118000	113000			UG/L
107131	8	ACRYLONITRILE		7550				UG/L
108883	495	TOLUENE	1000	17500	6300			UG/L
108907	111	CHLOROBENZENE	100					UG/L

APPENDIX A (continued)

CAS No	Old Storet	Search name	DW	FW	MW	Other	OtherHII	Units
108952	367	PHENOL		10200	5800			UG/L
115297	221	ENDOSULFAN		0.22	0.034			UG/L
116063	10	ALDICARB	3					UG/L
117817	386	DI-SEC-OCTYL PHTHALATE (DEHP)	6	400	400			UG/L
118741	264	HEXACHLOROBENZENE	1	6				UG/L
120821	500	TRICHLOROBENZENE, 1,2,4-	70					UG/L
120832	182	DICHLOROPHENOL, 2,4-		2020				UG/L
121142	196	DINITROTOLUENE, 2,4-		330				UG/L
122349	448	SIMAZINE	4					UG/L
122667	200	DIPHENYLHYDRAZINE, 1,2-		270				UG/L
124481	164	CHLORODIBROMOMETHANE	80					UG/L
127184	486	TETRACHLOROETHYLENE	5	5280	10200			UG/L
145733	966	ENDOTHALL	100					UG/L
156592	181	DICHLOROETHYLENE, CIS-1,2-	70					UG/L
156605	178	DICHLOROETHENE, TRANS-1,2-	100					UG/L
206440	245	FLUORANTHENE, C1-C4		3980	40			UG/L
309002	13	ALDRIN		3	1.3			UG/L
471341	15840	ALKALINITY, TOTAL - CARBONATE, BICARBONATE, & HYDROXIDE MIX					200	UEQ/L
608731	69	HEXACHLOROCYCLOHEXANE (MIXTURE)		100	0.34			UG/L
688733	1651	TRIBUTYLTIN		0.46	0.37			UG/L
959988	223	ENDOSULFAN, ALPHA-		0.22	0.034			UG/L
1024573	263	HEPTACHLOR EPOXIDE	0.2	0.52	0.053			UG/L
1071836	1036	GLYPHOSATE	700					UG/L
1330207	540	XYLENES MIX OF M + O + P	10000					UG/L
1332214	650	ASBESTOS	7000000					Fibers/L
1336363	421	PCBS, POLYCHLORINATED BIPHENYLS	500	2000	10000			NG/L
1563662	79	CARBOFURAN	40					UG/L
1646873	12	ALDICARB SULFOXIDE	4					UG/L
1646884	11	ALDICARB SULFONE	2					UG/L

APPENDIX A (continued)

CAS No	Old Storet	Search name	DW	FW	MW	Other	OtherHII	Units
1746016	198	2,3,7,8-TETRACHLORODIBENZO-P-DIOXIN (TCDD)	0.00003	0.01				UG/L
1912249	32	ATRAZINE	3	350	760			UG/L
1918021	390	PICLORAM	500					UG/L
2921882	125	CHLOROPYRIFOS		0.083	0.011			UG/L
7439896	279	IRON	300					UG/L
7439921	285	LEAD	15	65	210			UG/L
7439965	300	MANGANESE	50					UG/L
7439976	301	MERCURY	2	1.4	1.8			UG/L
7440020	322	NICKEL		470	74			UG/L
7440144	425	RADIUM-226/228	5					PCI/L
7440224	446	SILVER	100	3.4	1.9			UG/L
7440280	487	THALLIUM	2	1400	2130			UG/L
7440360	26	ANTIMONY	6	88	1500			UG/L
7440382	29	ARSENIC	10	340	69			UG/L
7440382	16099	ARSENIC, INORGANIC	10	340	69			UG/L
7440382	16103	ARSENIC (V)	10	850	2319			UG/L
7440382	16100	ARSENIC (III)	10	340	69			UG/L
7440393	40	BARIUM	2000					UG/L
7440417	51	BERYLLIUM	4	130				UG/L
7440439	74	CADMIUM	5	4.3	40			UG/L
7440473	127	CHROMIUM	100					UG/L
7440508	140	COPPER	1300	13	4.8			UG/L
7440611	516	URANIUM	30					UG/L
7440666	545	ZINC	5000	120	90			UG/L
7782447	201	DISSOLVED OXYGEN					4	MG/L
7782492	438	SELENIUM	50		290			UG/L
7782505	108	CHLORINE		0.019	0.013			MG/L
7783064	271	HYDROGEN SULFIDE		0.002	0.002			MG/L
8001352	496	TOXAPHENE	3	0.73	0.21			UG/L

APPENDIX A (continued)

CAS No	Old Storet	Search name	DW	FW	MW	Other	OtherHII	Units
10028178	513	TRITIUM	20000					PCI/L
10098972	470	STRONTIUM-90	8					PCI/L
13982633	424	RADIUM-226	5					PCI/L
14797558	334	NITROGEN, NITRATE (NO3) AS NO3	44					MG/L
14797650	335	NITROGEN, NITRITE (NO2) AS NO2	3.3					MG/L
14808798	17119	SULFATE (SO4) AS S	250					MG/L
14808798	472	SULFATE (SO4) AS SO4	250					MG/L
15262201	426	RADIUM-228	5					PCI/L
15972608	9	ALACHLOR	2					UG/L
16065831	129	CHROMIUM, TRIVALENT	100	570	10300			UG/L
16887006	107	CHLORIDE	250	860				MG/L
16984488	249	FLUORIDES	4					MG/L
17778880	17115	NITROGEN, NITRITE (NO2) AS N	1					MG/L
17778880	17116	NITROGEN, NITRATE (NO3) AS N	10					MG/L
17778880	336	NITROGEN, NITRITE (NO2) + NITRATE (NO3) AS N	10					MG/L
18540299	128	CHROMIUM, HEXAVALENT	100	16	1100			UG/L
23135220	351	OXAMYL	200					UG/L
33213659	224	ENDOSULFAN, BETA-		0.22	0.034			UG/L
	514	TURBIDITY				50		FTU
	514	TURBIDITY				50		JTU
	514	TURBIDITY				50		NTU
	1	PH	8.5	9	8.5		6.5	SU
	19	RADIOACTIVITY, ALPHA	15					PCI/L
	11797	SOLIDS, DISSOLVED	500					MG/L
	11737	COLIFORM, TOTAL				1000		CFU/100ML
	11737	COLIFORM, TOTAL				1000		#/100ML
	11737	COLIFORM, TOTAL				1000		MPN
	137	COLIFORM, TOTAL FECAL				200		CFU/100ML
	137	COLIFORM, TOTAL FECAL				200		#/100ML

APPENDIX A (continued)

CAS No	Old Storet	Search name	DW	FW	MW	Other	OtherHII	Units
	137	COLIFORM, TOTAL FECAL				200		MPN
	9780	ESCHERICHIA COLI				126		CFU/100ML
	11739	ENTEROCOCCUS		33	35			CFU/100ML

CAS No = Chemical Abstract Service Registry identification number for chemicals
Old STORET = identification number for method as previously used in STORET
DW = Drinking water
FW = Freshwater
MW =Marine water
OtherHII = parameters involving a range of values or a criteria the parameter must exceed

APPENDIX B: Summaries of the Water Quality Standards of the States of the Great Lakes Network

B1) Indiana Water Quality Standards
B2) Michigan Water Quality Standards
B3) Minnesota Water Quality Standards
B4) Wisconsin Water Quality Standards

APPENDIX B1: Summary of the Water Quality Standards of the State of Indiana
(This summary was intended for use as the WQS apply to National Parks within the state and is not an all-inclusive summary of the entire legislation.)

Source: Water Quality Standards Repository of Documents – USEPA.
http://www.epa.gov/ost/standards/wqslibrary/in/in.html Water Quality Standards are reviewed and updated on a regular basis and as such the legally binding documents are those published in the Federal Register.

327 IAC 2-1 Water Quality Standards Applicable to All State Waters Except Waters of the State Within the Great Lakes System Water quality standards for Indiana waters not on Lake Michigan. This chapter was not reviewed, as it does not apply to the Indiana Dunes National Lakeshore.

327 IAC 2-1.5 Water Quality Standards Applicable to All State Waters Within the Great Lakes System

327 IAC 2-1.5-3 Section 3 The goal of the state is to restore and maintain the chemical, physical, and biological integrity of the waters of the state within the Great Lakes System. In furtherance of this primary goal, it is the public policy of the state that the discharge of 1) toxic substances in toxic amounts be prohibited and 2) persistent and bioaccumulating toxic substances be reduced or eliminated.

327 IAC 2-1.5-4 Section 4 Antidegradation Policy

327 IAC 2-1.5-4 Section 5 Surface water use designations

1) All surface waters of the state within the Great Lakes system are designated for full-body contact recreation,
2) capable of supporting a well-balanced, warm water aquatic community (except as listed in subdivision (7)),
3) where temperatures permit, surface waters shall be capable of supporting put-and-take trout fishing. The following are designated as salmonid waters; list includes the East Branch of the Little Calumet River and its Tributaries downstream to Lake Michigan via Burns Ditch and Salt Creek above its confluence with the Little Calumet River, all of which flow through Indiana Dunes National Lakeshore.
4) – 6) All waters used for public water supply, industrial, or agricultural use are so designated.
7) – 8) Limited use waters and outstanding natural resource waters are designated under section 19a and 19b, respectively, of this rule pursuant to section 18 of this rule.

327 IAC 2-1.5-6 Bioaccumulative chemicals of concern – listed

327 IAC 2-1.5-8 Minimum surface water quality criteria
Sec. 8 a) All surface water quality criteria in this section, except those provided in subsection (b)(1), will cease to be applicable when the stream flows are less than the applicable stream design flow for the particular criteria as determined under 327 IAC 5-2-11.4.
Sec. 8 b) minimum water quality conditions;

APPENDIX B1: (continued)

1) all waters within Great Lakes system at all times, including mixing zones, shall be free from substances, materials, floating debris, oil, or scum attributable to municipal, industrial, agricultural, and other land use practices, or other discharges that do any of the following – A – E list objectionables, deleterious, nuisance, contributing to aquatic plant or algae growth, and acute toxics. Guidelines follow for calculating acute toxicity levels.
2) at all times, all waters outside of the applicable mixing zones shall be free of concentrations, that on the basis of scientific data, are believed to be sufficient to injure, be chronically toxic to animals, humans, aquatic life, plants. Guidelines follow for calculating chronic toxicity levels.

Table 8-1 Water quality criteria for protection of aquatic life
Table 8-2 Metals concentrations, hardness levels calculated
Table 8-3 Water quality criteria for protection of human health
Table 8-4 Water quality criteria for protection of wildlife

Sec. 8 6)c) subsection establishes minimum water quality criteria for aquatic life.
1) no substances imparting impalatable flavor or odor to food fish,
2) no pH below 6.0 or above 9.0,
3) concentrations of dissolved oxygen shall average 5.0 mg/L and not be less than 4.0 mg/L at any time,
4) conditions for temperature – includes no abnormal changes and temperature criteria for Lake Michigan,
5) criteria to regulate ammonia.

Sec. 8 6)d) subsection establishes water quality for cold water fish.
1) Dissolved oxygen concentrations shall not be less than 6.0 mg/L at any time and not less than 7.0 mg/L for spawning.
2) Maximum temperature rise above natural shall not exceed 2 degrees Fahrenheit (with clauses).

Sec. 8 6)e) subsection establishes bacteriological quality for recreational use – E.coli at 125/100 mL geometric mean.
Sec. 8 6)f) subsection establishes surface water quality for public water supply.
Sec. 8 6)g) subsection establishes surface water quality for industrial water supply.
Sec. 8 6)h) subsection establishes water quality for agricultural uses.
Sec. 8 6)i) subsection establishes water quality for limited uses. The quality of waters designated for limited uses under section 19)a) of this rule shall, at a minimum meet established criteria in subsections b), e), and g).

Table 8-9 Additional Criteria for Lake Michigan

327 IAC 2-1.5-10 Methods of Analysis
The analytical procedures used as methods of analysis to determine the chemical, bacteriological, biological, and radiological quality of waters sampled shall be in accordance with 40 CFR 136, Standard Methods for Examination of Water and Wastewater, or methods approved by the commissioner.

The following sections define toxicological calculation methods to be used in determining new criteria. Tier I criteria are based on more rigorous lab tests than are Tier II.
327 IAC 2-1.5-11 Determination of Tier I aquatic life criteria
327 IAC 2-1.5-12 Determination of Tier II aquatic life values
327 IAC 2-1.5-13 Determinations of BAFs
327 IAC 2-1.5-14 Determination of human health criteria and values

APPENDIX B1: (continued)

327 IAC 2-1.5-15 Determination of wildlife criteria

327 IAC 2-1.5-19 Limited Use Waters and Outstanding State Resource Waters
OSRWs include the Indiana portion of open waters of Lake Michigan and all waters of Indiana Dunes National Lakeshore.

APPENDIX B2: Summary of the Water Quality Standards of the State of Michigan
(This summary was intended for use as the WQS apply to National Parks within the State and is not an all-inclusive summary of the entire legislation.)

Source: Water Quality Standards Repository of Documents – USEPA
http://www.epa.gov/ost/standards/wqslibrary/mi/mi.html and
http://www.state.mi.us/orr/emi/admincode.asp?AdminCode=Single&Admin_Num=32301041&Dpt=EQ&RngHigh=

Water Quality Standards are reviewed and updated on a regular basis and as such the legally binding documents are those published in the Federal Register.

Department of Environmental Quality Surface Water Quality Division General Rules

Part 4. Water Quality Standards

R 323.1041 Purpose…to establish water quality requirements applicable to the Great Lakes, the connecting waters, and all other surface waters of the state, to protect the public health and welfare, to enhance and maintain the quality of water, to protect to states natural resources. Water quality of certain waters of the state may not meet standards as a result of natural causes or conditions unrelated to human influence. Where waters of the state may have been degraded due to past human activities and attainment of standards in the near future is not economically or technically achievable, these standards shall be used to improve water quality. These standards are the minimum water quality requirements by which the waters of the state are to be managed.

R 323.1043-44 Definitions

R 323.1050 Physical Characteristics
Rule 50. The waters of the state shall not have any of the following unnatural physical properties in quantities, which are or may become injurious to any designated use:

a) Turbidity
b) Color
c) Oil films
d) Floating solids
e) Foams
f) Settleable solids
g) Suspended solids
h) Deposits

R 323.1051 Dissolved solids
Rule 51.

1) The addition of any dissolved solids shall not exceed concentrations which are or may become injurious to designated uses, 2) Public water supply waters shall not exceed 125 mg/L chloride, the Great Lakes and connecting waters may not exceed 50 mg/L chloride as a monthly average.

R 323.1053 Hydrogen ion concentration
Rule 53. pH shall be maintained within the range of 6.5 to 9.0.

R 323.1057 Toxic substances
Rule 57.

APPENDIX B2: (continued)

1) Toxic substances…toxic levels shall not exceed the water quality value specified in, or developed pursuant to, the provisions of subrules 2) to 4) or conditions set forth by subrule 6). A variance may be granted consistent with provisions of R 323.1103.

2) Levels of toxic substances shall not exceed aquatic life values specified in tables 1 and 2, or in the absence of such values, values derived according to the following (procedures for deriving Tier I values based on toxicological calculations).

3) Levels of toxic substances shall not exceed wildlife values specified in table 4 or derived according to the following process (toxicology procedures for deriving Tier I values).

4) Levels of toxic substances shall not exceed human health values specified in tables 7 and 8, or in the absence of such values, the values derived according to the following process (procedures for deriving human cancer values and human noncancer values based on Tier I and Tier II classifications).

5) Bioaccumulation factors (BAFs) used in derivation of values in subrules 3) and 4) shall be developed according to the following process (procedures for BAF development).

Table 1 Aquatic maximum values for protection of aquatic Life in ambient waters
Table 2 Chronic water quality values for protection of aquatic life in ambient waters
Table 3 Tier II acute factors
Table 4 Water quality values for protection of wildlife (DDT, Hg, PCBs, TCDD)
Table 5 Bioaccumulative chemicals of concern (list only)
Table 6 Exposure parameters for the 5 representative species
Table 7 Human noncancer values for protection of human health
Table 8 Human cancer values for protection of human health
Table 9 Food chain multipliers for trophic levels 2,3, and 4

R 323.1058 Radioactive substances
Rule 58. Regulation of radioactive substances discharged to the waters of the state shall be pursuant to 10 CFR S20.1 and the USEPA.

R 323.1060 Plant nutrients
Rule 60.

1)…consistent with Great Lakes protection, phosphorus shall be controlled from point source discharges to achieve 1 mg/L total phosphorus as a monthly average…

2)…nutrients shall be limited to prevent stimulation of growth of aquatic plants, fungi, or bacteria, which are or may become injurious to designated uses of the waters of the state.

R 323.1062 Microorganisms
Rule 62. Regulating levels of indicator bacteria including a limit of 130 Escherichia coli per 100 mL as a 30-day geometric mean for full body contact recreation waters.

R 323.1064 Dissolved oxygen in Great Lakes, connecting waters, and inland streams
Rule 64.

1) Great Lakes and coldwater fish waters shall maintain 7 mg/L dissolved oxygen, all others shall maintain 5 mg/L.
2) Waters of the state that do not meet the above standards shall be upgraded to meet those standards. Interim guidelines described for different water body use designations.

R 323.1065 Dissolved oxygen in inland lakes
Rule 65. Describes minimums for inland lakes during stratification. At all other times dissolved oxygen concentrations greater than 5 mg/L shall be maintained.

APPENDIX B2: (continued)

Rules 69 through 75. Temperature
Regulations for seasonal temperatures and variations.

Rule 82 Mixing Zones – Discharge permit calculation procedures BCCs will be phased out of mixing zones by 3/23/07.

R 323.1096 Determinations of compliance with water quality standards
Rule 96. Analysis of waters shall be made pursuant to procedures outlined in 40 CFR S136 or pursuant to other methods approved by the commission or the USEPA.

R 323.1098 Antidegradation
Rule 98. Applicability, definitions, procedures for antidegradation.

6) If high quality water bodies are designated outstanding state resource waters (OSRW), the water quality may not be lowered. OSRW list includes c) Water bodies within the designated boundaries of Sleeping Bear Dunes National Lakeshore, Pictured Rocks National Lakeshore, and Isle Royale National Park.

7) All surface waters of the Lake Superior Basin that are not identified as OSRW are designated as Lake Superior Basin - Outstanding International Resource Waters (LSB-OIRW).

R 323.1100 Designated uses
Rule 100.

1) At a minimum, all surface waters of the state are designated for, and shall be protected for, all of the following uses: agriculture, navigation, industrial water supply, public water supply, warmwater fishery, other indigenous aquatic life and wildlife, partial body contact recreation.

2) All surface waters of the state are designated for full body contact recreation from May 1 to October 31.

3) – 9) describe waters that are coldwater, trout, or public water supply.

10) wetlands and use attainment analysis for discharges to wetlands.

11) procedures for designation of limited warmwater fishery or limited coldwater fishery subcategories for waters not meeting dissolved oxygen levels in those categories.

R 323.1103 Variances
Rule 103. Restrictions on the granting of variances for discharge permits

APPENDIX B3: Summary of the Water Quality Standards of the State of Minnesota

(This summary was intended for use as the WQS apply to National Parks within the State and is not an all-inclusive summary of the entire legislation.)

Source: Water Quality Standards Repository of Documents – USEPA
http://www.epa.gov/ost/standards/wqslibrary/mn/mn.html and word documents provided by the USEPA Water Quality Standard Coordinator for Region V.

Water Quality Standards are reviewed and updated on a regular basis and as such the legally binding documents are those published in the Federal Register.

STANDARDS FOR PROTECTION OF QUALITY AND PURITY

7050.0110 SCOPE.
Parts 7050.0130 to 7050.0227 apply to all waters of the state, both surface and underground, and include general provisions applicable to the maintenance of water quality and aquatic habitats; definitions of water use classes; standards for dischargers of sewage, industrial, and other wastes; and standards of quality and purity for specific water use classes. This chapter shall apply to point source and nonpoint source discharges and to physical alterations of wetlands. Other water quality rules of general or specific application that include any more stringent water quality or effluent standards or prohibitions are preserved.

7050.0170 NATURAL WATER QUALITY.
The waters of the state may, in a natural condition, have water quality characteristics or chemical concentrations approaching or exceeding the water quality standards. Natural conditions exist where there is no discernible impact from point or nonpoint source pollutants attributable to human activity or from a physical alteration of wetlands. Natural background levels are defined by water quality monitoring. Where water quality monitoring data are not available, background levels can be predicted based on data from a watershed with similar characteristics. Where natural background levels do not exceed applicable standards, the addition of pollutants from human activity and resulting point or nonpoint source discharges shall be limited such that, in total, the natural background levels and the additions from human activity shall not exceed the standards.
When reasonable justification exists to preserve the higher natural quality of a water resource, the commissioner may use the natural background levels that are lower than the applicable site-specific standards to control the addition of the same pollutants from human activity. The reasonable justification must meet the requirements under parts 7050.0180 and 7050.0185.

7050.0180 NONDEGRADATION FOR OUTSTANDING RESOURCE VALUE WATERS.
Subpart 1. Policy. The agency recognizes that the maintenance of existing high quality in some waters of outstanding resource value to the state is essential to their function as exceptional recreational, cultural, aesthetic, or scientific resources. To preserve the value of these special waters, the agency will prohibit or stringently control new or expanded discharges from either point or nonpoint sources to outstanding resource value waters.
Subpart 2. Definitions. This section includes definitions for;

- **A.** "Outstanding resource value waters" are waters within the Boundary Waters Canoe Area Wilderness, Voyageur's National Park, and Department of Natural Resources designated scientific and natural areas, wild, scenic, and recreational river segments, Lake Superior, those portions of the Mississippi River from Lake Itasca to the southerly boundary of Morrison County that are included in the Mississippi Headwaters Board comprehensive plan dated February 12, 1981, and other waters of the state with high water quality, wilderness characteristics, unique scientific or ecological significance, exceptional recreational value, or other special qualities which warrant stringent protection from pollution.

APPENDIX B3: (continued)

B. "New discharge" means a discharge that was not in existence on the effective date the outstanding resource value water was designated as described in parts 7050.0460 and 7050.0470.

7050.200 Water Use Classifications for Waters of the State

Subpart 1. **Introduction.** Based on considerations of best usage in the interest of the public and in conformance with the requirements of the applicable status, the waters of the state shall be grouped into one or more of the classes in subparts 2 to 8.

Subpart 2. Class 1 waters: domestic consumption. Includes all waters of the state which are or may be used as a source of supply for drinking, culinary or food processing use or other domestic purposes, and for which quality control is or may be necessary to protect the public health, safety, or welfare. Specific Standards of Quality and Purity for Class 1 Waters are found in 7050.0221.

Subpart 3. Class 2 waters: aquatic life and recreation. Includes all waters of the state which do or may support fish, other aquatic life, bathing, boating, or other recreational purposes, and where quality control is or may be necessary to protect aquatic or terrestrial life or their habitats, or the public health, safety, or welfare. Specific Standards of Quality and Purity for Class 2 Waters are found in 7050.0222.

Subpart 4. Class 3 waters: industrial consumption. Includes all waters of the state which are or may be used as a source of supply for industrial process or cooling water, or any other industrial or commercial purposes, and for which quality control is or may be necessary to protect the public health, safety, or welfare. Specific Standards of Quality and Purity for Class 3 Waters are found in 7050.0223.

Subpart 5. Class 4 waters: agriculture and wildlife. Includes all waters of the state which are or may be used for any agriculture purposes, including stock watering and irrigation, or by waterfowl or other wildlife, and for which quality control is or may be necessary to protect terrestrial life and its habitat or the public health, safety, or welfare. Specific Standards of Quality and Purity for Class 4 Waters are found in 7050.0224.

Subpart 6. Class 5 waters: aesthetic enjoyment and navigation. Includes all waters of the state which are or may be used for any form of water transportation or navigation, or fire prevention, and for which quality control is or may be necessary to protect the public health, safety, or welfare. Specific Standards of Quality and Purity for Class 5 Waters are found in 7050.0225.

Subpart 7. Class 6 waters: other uses. Includes all waters of the state which are or may serve the above listed uses or any other beneficial uses not listed herein… Specific Standards of Quality and Purity for Class 6 Waters are found in 7050.0226.

Subpart 8. Class 7 waters: limited resource value waters. Limited resource value waters include surface waters of the state, which have been subject to a use attainability analysis and have been found to have limited value as a water resource. Water quantities in these waters are intermittent or less than one cubic foot per second at the once in ten year, seven-day low flow as defined in part 7050.0210, subpart 7. These waters shall be protected so as to allow secondary body contact use, to preserve the groundwater for use as a potable water supply, and to protect aesthetic qualities of the water. It is the intent of the agency that very few waters be classified as limited resource value waters. Specific Standards of Quality and Purity for Class 7 Waters are found in 7050.0227.

These use classes are further broken down into more specific categories. For example, Class 2A waters are defined as those with quality to permit propagation and maintenance of a healthy community of cold water sport or commercial fish and associated aquatic life, and their habitats. These waters are suitable for aquatic recreation of all kinds as well as a source of drinking water. A Class 2B water permits propagation and maintenance of a healthy community of cool or warm water sport or commercial fish and associated aquatic life, and their habitats, as well as all kinds of aquatic recreation but is not protected as a source of drinking water. The definition of the subclasses for each water use category is included in the sections for Specific Standards of Quality and Purity for each class. Classifications for waters in Major Surface Water Drainage Basins can be found in 7050.0470

APPENDIX B3: (continued)

LAKE SUPERIOR BASIN WATER STANDARDS

7052.0005 SCOPE.

A. This chapter establishes aquatic life, human health, and wildlife water quality standards and criteria for Great Lakes Initiative (GLI) pollutants; nondegradation standards for surface waters of the state in the Lake Superior Basin including, on a limited basis as described in item B, Class 7 waters; and implementation procedures for deriving effluent limitations from these standards and criteria. Other water quality standards, nondegradation standards, and implementation procedures applicable to the surface waters of the state in the Lake Superior Basin can be found in chapters 7050 and 7065.

B. The water quality standards, nondegradation standards, and implementation procedures in this chapter apply to discharges to Class 7 waters to the extent necessary to ensure compliance with the standards established in this chapter in any downstream Class 2 waters.

7052.0010 DEFINITIONS

Subpart 34. Outstanding international resource waters or OIRWs.

"Outstanding international resource waters" or "OIRWs" means the surface waters of the state in the Lake Superior Basin, other than Class 7 waters and those waters designated as outstanding resource value waters as described in parts 7050.0460 and 7050.0470. The OIRWs designation prohibits any new or expanded point source discharge of BSICs unless a nondegradation demonstration that includes the installation of the best technology in process and treatment is completed under part 7052.0320, and approved by the agency under part 7052.0330.

7052.0015 INCORPORATIONS BY REFERENCE.

The documents in items A through D are adopted and incorporated by reference into this chapter. The documents, including future amendments, in items E through G are adopted and incorporated by reference and are not subject to frequent change.

A. Great Lakes Water Quality Initiative Methodologies for Development of Aquatic Life Criteria and Values, Code of Federal Regulations, title 40, part 132, Appendix A, as amended through March 12, 1997.

B. Great Lakes Water Quality Initiative Methodology for Deriving Bioaccumulation Factors, Code of Federal Regulations, title 40, part 132, Appendix B, as amended through March 12, 1997.

C. Great Lakes Water Quality Initiative Methodology for Development of Human Health Criteria and Values, Code of Federal Regulations, title 40, part 132, Appendix C, as amended through March 12, 1997.

D. Great Lakes Water Quality Initiative Methodology for the Development of Wildlife Criteria, Code of Federal Regulations, title 40, part 132, Appendix D, as amended through March 12, 1997.

E. EPA Technical Support Document for Water Quality-based Toxics Control issued by the U.S. EPA, Office of Water, as publication EPA-505-2-90-001 (Washington D.C., March 1991). The technical support document is available through the Minitex interlibrary loan system. It is not subject to frequent change.

F. The Metals Translator: Guidance for Calculating a Total Recoverable Permit Limit from a Dissolved Criterion issued by the U.S. EPA, Office of Water, as publication EPA-823-B-96-007 (Washington D.C., June 1996). The metals translator guidance is available through the Minitex interlibrary loan system. It is not subject to frequent change.

G. Chapter 3 of the U.S. EPA Water Quality Standards Handbook, Second Edition issued by the U.S. EPA, Office of Science and Technology, as publication EPA-823-B-94-005a (Washington D.C., August 1994). The handbook is available through the Minitex interlibrary loan system. It is not subject to frequent change.

APPENDIX B3: (continued)

WATER QUALITY STANDARDS AND CRITERIA, AND BIOACCUMULATION FACTORS

7052.0100 WATER QUALITY STANDARDS.

Subpart 1. Applicability. The ambient water quality standards in subparts 2 to 6 are Class 2 standards for the protection of aquatic life, human health, and wildlife from the GLI pollutants. The numeric standard for a GLI pollutant includes the CS, MS, and FAV. Some pollutants do not have an MS or an FAV because of insufficient data. For these pollutants, the CS is the numeric standard. Additional standards applicable to the surface waters of the state in the Lake Superior Basin are found in chapters 7050 and 7065, including standards applicable to drinking water sources, which are listed in parts 7050.0220 and 7050.0221.

APPENDIX B4: Summary of the Water Quality Standards of the State of Wisconsin
(This summary was intended for use as the WQS apply to National Parks within the State and is not an all-inclusive summary of the entire legislation.)

Source: Water Quality Standards Repository of Documents – USEPA
http://www.epa.gov/waterscience/standards/wqslibrary/wi/wi.html

Water Quality Standards are reviewed and updated on a regular basis and as such the legally binding documents are those published in the Federal Register.

Category of Standards

NR102.04(1) General – To preserve and enhance the quality of waters, standards are established to govern water management decisions. Waters shall be free from:

- **a)** Substances that will cause objectionable deposits
- **b)** Floating or submerged debris, oil, scum or other material
- **c)** Material producing color, odor, taste or unsightliness
- **d)** Substances in concentrations or combinations which are considered toxic or harmful to humans, animal, plant, or aquatic life

Wisconsin categorizes all waters of the state according to the following designated uses (NR102.04)

NR102.04(3) Fish and Other Aquatic Life Uses

- **a)** Cold water communities – this subcategory includes surface waters capable of supporting a community of cold water fish and other aquatic life, or serving as a spawning area for cold water fish species.
- **b)** Warm water sport fish communities – includes surface waters capable of supporting a community of warm water sport fish or serving as a spawning area for warm water sport fish.
- **c)** Warm water forage communities – includes surface waters capable of supporting an abundant diverse community of forage fish and other aquatic life.
- **d)** Limited forage fish communities (intermediate surface waters) – includes surface waters of limited capacity and naturally poor water quality or habitat.
- **e)** Limited aquatic life (marginal surface waters) – includes surface waters of severely limited capacity and naturally poor water quality or habitat.

NR102.04(5) Recreational Use

A sanitary survey and/or evaluation to assure protection from fecal contamination is the chief criterion determining suitability for recreational use.

NR102.04(6) Standards for Public Health and Welfare – all surface waters shall meet the human threshold and human cancer criteria specified in NR105.08 and NR105.09.

NR102.04(7) Standards for Wildlife – all surface waters shall be classified for wildlife uses and meet the wildlife criteria specified in NR105.07

NR102.05 Application of Standards

NR102.05(1)(a) Antidegradation. No waters of the state shall be lowered in quality unless it has been affirmatively demonstrated to the department that such a change is justified as a result of necessary economic and social development, provided that no new or increased effluent interferes with or becomes injurious to any assigned uses made of or presently possible in such waters.

NR102.05(1)(b) Classification system – All waters shall be classified as one of the following

APPENDIX B4: (continued)

1. Outstanding Resource Waters as listed in NR102.10 – these waters may not be lowered in quality (include St.Croix and Namekagon Rivers)
2. Exceptional Resource Waters as listed in NR102.11 – may not be lowered in quality except as provided in NR207.

3. Great Lakes System Waters as listed in NR102.12 – for the purpose of administering NR207, consistent with NR105 and 106, these waters are to be protected from the impacts of persistent, bioaccumulating toxic substances by avoiding or limiting to the maximum extent practicable increases in these substances
4. Fish and aquatic life waters as listed in NR102.13
5. Waters listed in tables 3 through 8 of NR102.13.

NR 104 Uses and Designated Standards (Intrastate and Interstate waters)
104.01 General – it is the goal of the state of Wisconsin that all waters be of quality to permit the use of water resources for all legal purposes. Most waters of Wisconsin meet the goals but some by natural or historical conditions do not and a system is provided within which small streams and other surface waters, which cannot support high quality uses, are granted a variance from the high quality criteria.
104.02 Surface water classifications and effluent limitations – surface waters are classified according to hydrologic characteristics; lakes or flowages, diffused surface waters, wetlands, wastewater effluent channels, non-continuous, continuous streams
104.21 The Mississippi River is used for commercial and recreational fishing, industrial and cooling water supply, boating, hunting, commercial shipping, and waste assimilation. Water quality shall meet the standards and requirements for recreational use and fish and aquatic life.
104.22 1) The St. Croix River has high scenic and aesthetic value and is used for recreation, fishing, hydropower, commercial shipping, stock and wildlife water supply, and waste assimilation. Its water quality shall meet the standards and requirements for recreational use and fish and aquatic life. The standards for public water supply shall be met downstream from the north line of Polk County.
2) through 4) other border rivers.
104.23 Lake Superior is used for recreation, commercial and recreational fishing, shipping, municipal water supply, industrial and cooling water, and waste assimilation. Lake Superior open waters shall meet the criteria and requirements for public water supplies. All waters of Lake Superior shall meet the standards for recreational use and fish and aquatic life.

NR 105 Surface water Quality Criteria and Secondary Values for Toxic Substances. This chapter establishes water quality criteria, methods for developing water quality criteria and secondary values for toxic substances.

NR 106 Procedures for Calculating Water Quality Based Effluent Limitations for Toxic and Organoleptic Substances Discharged to Surface Waters. This chapter is an example of how water quality standards are applied to dischargers.

NR 207 Water Quality Antidegradation Policy. This chapter sets forth the antidegradation implementation procedures.

APPENDIX C: Great Lakes Network Park Water Body Tables

Appendix	Park code	Watershed	HUC code	Resource management plan	CWAP Category
C1	APIS	Lake Superior	4020300	RMP 1999	II
C2	GRPO	Baptism-Brule	4010101	RMP draft 2000	I
C3	INDU	Little Calumet-Galien	4040001	RMP 1999	I
C4	ISRO	Lake Superior	4020300	GMP 1998, RMP 1999	I
C5	MISS	Twin Cities	7010206	Comprehensive 1994	I
C6	PIRO	Betsy-Chocolay	4020201	RMP 2000	I
C7	 SACN	Lower St. Croix Upper St. Croix Namekagon	7030005 7030001 7030002	 RMP WRMP	 II
C8	SLBE	Betsie-Platte	4060104		I
C9	VOYA	Rainy Lake	9030003	Draft 2000	II

APPENDIX C1: APIS

Waterbodies in park	Legal status	Reason
Lake Superior		
Numerous bogs		
Lagoons		
Sand River		

As per Park Management Plan
Threats: nearshore human activities such as wastewater, agriculture runoff, atmospheric deposition, PCBs, DDT, DDE, DDD, mercury, dieldrin, chlordane, toxaphene. Concerns about food chain bioaccumulation.
Baseline: Several short-term studies done in the 1970's, 1980's and 1996. Biennual sampling at 5 open lake sites, 3 lagoons and mouth of Sand River. 5-year more extensive sampling at same sites for chemical and biological parameters.
Needs:
Notes: Wisconsin has not designated Lake Superior as ORW. None of the water bodies are 303(d) listed. WI Counties = Bayfield.

APPENDIX C2: GRPO

Waterbodies in park	Legal status	Reason
Lake Superior	ORVW	
Grand Portage Creek		
Poplar Creek		
Snow Creek		
Pigeon River	303(d)	Hg

As per Park Management Plan
Threats: Atmosperic deposition Hg, PCB
Baseline: 1994-5 macroinverts and chem (Boyle and Richmond 1997). Probably not enough long-term data.
Needs: Establish air quality baseline and maintain up-to-date. Sampling for physical, chemical, and bacteria.
Notes: Atmospheric deposition of mercury. Numerous boggy areas, swamps and lakes give rise to creeks draining area to Lake Superior. MN Counties = Cook, Lake

APPENDIX C3: INDU

Waterbodies in park	Legal status	Reason
Lake Michigan	OSRW	
Grand Calumet River	303(d)	FCA for PCB, Hg; CN, oil, pesticides, impaired biota, E.coli, Cd, Zn, PAH
Little Calumet River	303(d)	E.coli, CN, pesticides, DO
Long Lake		
Mineral Spring		
Salt Creek		
Inland Marsh		
West Beach Pannes		
Cowles Bog		
Little Lake		
Howe's Prairie Marsh		
Dunes Creek		

As per Park Management Plan
Threats: Heavy industry air and water discharges, agricultural runoff. Road salt runoff, leeching landfills, and settling ponds. Bacteria from human waste and natural wetlands.
Baseline: Some monitoring being done on waterways thru and adjacent to. Including bacteria at beaches.
Needs:
Notes: FCA= fish consumption advisory for atmospheric deposition. All water bodies within Indiana Dunes National Lakeshore are designated Outstanding State Resource Waters. IN Counties = Lake, Porter, LaPorte

APPENDIX C4: ISRO

Waterbodies in park	Legal status	Reason
Lake Superior	OIRW/303(d)	FCA-PCB, Hg, chlordane, dioxin
Ahmik Lake		
Amygdaloid Lake		
Angleworm Lake		
Beaver Lake		
Benson Lake		
Big Siskiwit River		
Chickenbone Lake		
Daisyfarm Lake		
Desor Lake		
Dustin Lake		
Epidote Lake		
Eva Lake		
Feldtmann Lake		
Forbes Lake		
George Lake		
Grace Creek		
Halloran Lake		
Harvey Lake		
Hatchet Lake		

APPENDIX C4: ISRO (continued)

Waterbodies in park	Legal status	Reason
Intermediate Lake		
John Lake		
Lesage Lake		
Linklater Lake		
Little Siskiwit River		
Livermore Lake		
Mason Lake		
McDonald Lake		
Mount Franklin Lake		
Mud Lake		
Otter Lake		
Patterson Lake		
Richie Lake		
Sargent Lake		
Scholtz Lake		
Shesheeb Lake		
Siskiwit Lake	303(d)	FCA - PCBs, Hg
Sumner Lake		
Stickleback Lake		
Tobin Creek		
Wagejo Lake		
Wallace Lake		
Whittlesey Lake		
Washington Creek		

As per Park Management Plan
Threats: Atmospheric deposition (Hg). Human usage - wastewater, fuels.
Baseline: 1995-1997 inland lakes fishery and zooplankton inventory included physical/chemical water conditions.
Needs: No water resources management plan.
Notes: FCA = fish consumption advisory. Michigan has designated Lake Superior an Outstanding International Resource Water. All water bodies of Isle Royale National Park are designated Outstanding State Resource Waters. Water resources make up 75% of total park acreage. Over 200 inland lakes in all.

APPENDIX C5: MISS

Waterbodies in park	Legal status	Reason
Mississippi River	303(d)	Aquatic life, turbidity, PCB, bacteria
Crow River		
Rush Creek		
Rum River		
Coon Creek		
Minnehaha Creek		
Minnesota River		
Vermillion River		
St. Croix River		

APPENDIX C5: MISS (continued)

As per Park Management Plan
Threats: discharges, urban runoff, contaminated sediments, erosion.
Baseline:
Needs:
Notes: Various tributaries and sections of the Mississippi River are 303(d) listed. 40% of the corridor is classified wetlands. ORW = those portions of the Mississippi River from Lake Itasca to the southerly boundary of Morrison County that are included in the Mississippi Headwaters Board comprehensive plan dated February 12, 1981. MN Counties = Anoka, Hennepin, Ramsey, Dakota, Washington. WI Counties = Pierce.

APPENDIX C6: PIRO

Waterbodies in park	Legal status	Reason
Lake Superior	OIRW	
Grand Sable Lake	303(d)	Hg
Beaver Lake		
Little Beaver Lake		
Chapel Lake		
Little Chapel Lake		
Miners Lake		
Trappers Lake		
Legion Lake		
Kingston Lake		
Shoe Lakes		
Miners River		
Hurricane River		
Mosquito River		
Munising Creek		
Chapel Creek		
Section 34 Creek		
Spray Creek		
Sevenmile Creek		
Beaver Creek		
Rhody Creek		
Sullivan Creek		
Sable Creek		
Grand Sable Creek		

As per Park Management Plan
Threats: Land use practices, near park development, atmospheric deposition, invasive species, viewshed impacts.
Baseline: Three-year study of park streams 1994-96 (USGS-BRD). Three-year multi-park inland lake study completed in 1999.
Needs: In position to initiate comprehensive aquatics monitoring program, base funding and staff needed.
Notes: All water bodies with Pictured Rocks National Lakeshore are designated Outstanding State Resource Waters. Michigan has designated Lake Superior an Outstanding International Resource Water. MI Counties in park boundaries = Alger

APPENDIX C7: SACN

Waterbodies in park	Legal status	Reason
Namekagon River	ORW	
Saint Croix River*	ORW, 303(d)	bioaccumulative toxics
Saint Croix Flowage	303(d)	Hg
Lake Namekagon		
Nelson Lake		
Totogatic Lake		
Totogatic River		
Minong Flowage	303(d)	Hg
Hayward Lake		
Gull Lake		
Pear Lake		
Upper Tamarack River		
Lower Tamarack River		
Trade River		
Yellow River		
Yellow Lake	303(d)	Hg
Apple River		
Kinnikinnic River		
Clam River		
Wood River		
Wood Lake		
MudHen Lake	303(d)	Hg
Spirit Lake		
Kettle River	ORW	
Snake River		
Rush Lake		
Rush Creek		
Goose Creek	303(d)	Excessive. nutrients
Sunrise River	303(d)	Aquatic life, impaired biota, indicator bacteria

As per Park Management Plan
Threats: Upper St.Croix - non-point source runoff, municipal wastewater discharge, cranberry effluents, atmospheric deposition.
Baseline:
Needs:
Notes: * MN lists the entire St. Croix River as impaired for bioaccumulative toxics.
WI Counties = Bayfield, Sawyer, Washburn, Burnet, Douglas, Polk, St. Croix, Pierce. MN Counties = Pine, Chisago, Washington.

APPENDIX C8: SLBE

Waterbodies in park	Legal status	Reason
Lake Michigan		
Lake Manitou		
Tamarack Lake		
Florence Lake		
Shell Lake		

APPENDIX C8: SLBE (continued)

School Lake		
Big Glen Lake	303(d)	FCA - PCBs, Hg, chlordane
Little Glen Lake	303(d)	FCA - PCBs, Hg, chlordane
North Bear Lake		
Otter Lake		
Otter Creek		
Shalda Creek		
Crystal River		
Platte River		
Platte Lake		
Little Platte Lake		
Loon Lake		
Rush Lake		
Long Lake		

As per Park Management Plan
Threats:
Baseline:
Needs:
Notes: All water bodies within Sleeping Bear Dunes National Lakeshore are designated Outstanding State Resource Waters. MI Counties in park boundaries = Leelanau, Benzie.

APPENDIX C9: VOYA

Waterbodies in park	Legal status	Reason
Rainy Lake		
Kabetogama Lake		
Sand Point Lake		
Namakan Lake		
Agnes Lake		
Beast Lake		
Brown Lake		
Cruiser Lake		
Ek Lake		
Fishmouth Lake		
Jorgens Lake		
Little Shoepack		
Little Trout Lake		
Locator Lake		
Loiten Lake		
Lucille Lake		
McDevitt Lake		
Mukooda Lake		

APPENDIX C9: VOYA (continued)

Waterbodies in park	Legal status	Reason
Mud Lake		
Net Lake		
O'Leary Lake		
Oslo Lake		
Peary Lake		
Quarterline Lake		
Quill Lake		
Ryan Lake		
Shoepack Lake		
Tooth Lake		
War Club Lake		
Weir Lake		
Wiyapka Lake		
Clyde Creek		
Namakan River		
Ash River		
Moose River		
Johnson River		

As per Park Management Plan
Threats: Many lakes moderately sensitive to acidification, water level controlled at dams (IJC regulates), Hg, PCBs, human use (fuels, waste), adjacent landuse, low yield aquifers.
Baseline: Many studies have been done, few long-term. USGS-WRD report to have been finished in 2001.
Needs: Staffing for water quality management.
Notes: All water bodies in the Park are designated Outstanding Resource Waters. Rainy, Kabetogama, Sand Point, Namakan Lakes make up 96% of water coverage in park. Numerous peatlands and bogs. MN Counties within park = Koochiching, St. Louis

APPENDIX D: Annex 1 of the Great Lakes Water Quality Agreement

The Great Lakes Water Quality Agreement is an agreement between the United States and Canada protecting the ecosystem of the Great Lakes Basin. Annex 1 spells out the specific water quality objectives to be met. When these objectives are not met, the area is listed as an Area of Concern for priority remediation.

Great Lakes Water Quality Agreement

ANNEX 1 - SPECIFIC OBJECTIVES

These objectives are based on available information on cause/effect relationships between pollutants and receptors to protect the recognized most sensitive use in all waters. These objectives may be amended, or new objectives may be added, by mutual consent of the parties.

I. CHEMICAL

A. **Persistent toxic substances**

1. Organic

(a) Pesticides

Aldrin/Dieldrin

The sum of the concentration of aldrin and dieldrin in water should not exceed 0.001 micrograms per litre. The sum of concentrations of aldrin and dieldrin in the edible portion of fish should not exceed 0.3 micrograms per gram (wet weight basis) for the protection of human consumers of fish.

Chlordane

The concentration of chlordane in water should not exceed 0.06 micrograms per litre for the protection of aquatic life.

DDT and Metabolites

The sum of the concentrations of DDT and its metabolites in water should not exceed 0.003 micrograms per litre. The sum of the concentrations of DDT and its metabolites in whole fish should not exceed 1.0 microgram per gram (wet weight basis) for the protection of fish-consuming aquatic birds.

Endrin

The concentration of endrin in water should not exceed 0.002 micrograms per litre. The concentration of endrin in the edible portion of fish should not exceed 0.3 micrograms per gram (wet weight basis) for the protection of human consumers of fish.

Heptachlor/Heptachlor Epoxide

The sum of the concentrations of heptachlor and heptachlor epoxide in water should not exceed 0.001 micrograms per litre. The sum of concentrations of heptachlor and heptachlor epoxide in edible portions of fish should not exceed 0.3 micrograms per gram (wet weight basis) for the protection of human consumers of fish.

Lindane

The concentration of lindane in water should not exceed 0.01 micrograms per litre for the protection of aquatic life. The concentration of lindane in edible portions of fish should not exceed 0.3 micrograms per gram (wet weight basis) for the protection of human consumers of fish.

Methoxychlor

The concentration of methoxychlor in water should not exceed 0.04 micrograms per litre for the protection of aquatic life.

Mirex

For the protection of aquatic organisms and fish-consuming birds and animals, mirex and its degradation products should be substantially absent from water and aquatic organisms. Substantially absent here means less than detection levels as determined by the best scientific methodology available.

Toxaphene

The concentration of toxaphene in water should not exceed 0.008 micrograms per litre for the protection of aquatic life.

(b) Other Compounds

Phthalic Acid Esters

The concentration of dibutyl phthalate and di (2-ethylhexyl) phthalate in water should not exceed 4.0 micrograms per litre and 0.6 micrograms per litre, respectively, for the protection of aquatic life. Other phthalic acid esters should not exceed 0.2 micrograms per litre in waters for the protection of aquatic life.

Polychlorinated Biphenyls (PCBs)

The concentration of total polychlorinated biphenyls in fish tissues (whole fish, calculated on a wet weight basis), should not exceed 0.1 micrograms per gram for the protection of birds and animals which consume fish.

Unspecific Organic Compounds

For other organic contaminants, for which Specific Objectives have not been defined, but which can be demonstrated to be persistent and are likely to be toxic, the concentrations of such compounds in water or aquatic organisms should be substantially absent, i.e., less than detection levels as determined by the best scientific methodology available.

2. Inorganic

(a) Metals

Arsenic

The concentrations of total arsenic in an unfiltered water sample should not exceed 50 micrograms per litre to protect raw waters for public water supplies.

Cadmium

The concentration of total cadmium in an unfiltered water sample should not exceed 0.2 micrograms per litre to protect aquatic life.

Chromium

The concentration of total chromium in an unfiltered water sample should not exceed 50 micrograms per litre to protect raw waters of public water supplies.

Copper

The concentration of total copper in an unfiltered water sample should not exceed 5 micrograms per litre to protect aquatic life.

Iron

The concentration of total iron in an unfiltered water sample should not exceed 300 micrograms per litre to protect aquatic life.

Lead

The concentration of total lead in an unfiltered water sample should not exceed 10 micrograms per litre in Lake Superior, 20 micrograms per litre in Lake Huron and 25 micrograms per litre in all remaining Great Lakes to protect aquatic life.

Mercury

The concentration of total mercury in a filtered water sample should not exceed 0.2 micrograms per litre nor should the concentration of total mercury in whole fish exceed 0.5 micrograms per gram (wet weight basis) to protect aquatic life and fish-consuming birds.

Nickel

The concentration of total nickel in an unfiltered water sample should not exceed 25 micrograms per litre to protect aquatic life.

Selenium

The concentration of total selenium in an unfiltered water sample should not exceed 10 micrograms per litre to protect the raw water for public water supplies.

Zinc

The concentration of total zinc in an unfiltered water sample should not exceed 30 micrograms per litre to protect aquatic life.

(b) Other Inorganic Substances

Fluoride

The concentration of total fluoride in an unfiltered water sample should not exceed 1200 micrograms per litre to protect raw water for public water supplies.

Total dissolved solids

In Lake Erie, Lake Ontario and the International Section of the St. Lawrence River, the level of total dissolved solids should not exceed 200 milligrams per litre. In the St. Clair River, Lake St. Clair, the Detroit River and the Niagara River, the level should be consistent with maintaining the levels of total dissolved solids in Lake Erie and Lake Ontario not to exceed 200 milligrams per litre. In the remaining boundary waters, pending further study, the level of total dissolved solids should not exceed present levels.

B. **Non-Persistent toxic substances**

1. Organic Substances

(a) Pesticides

Diazinon

The concentration of diazinon in an unfiltered water sample should not exceed 0.08 micrograms per litre for the protection of aquatic life.

Guthion

The concentration of guthion in an unfiltered water sample should not exceed 0.005 micrograms per litre for the protection of aquatic life.

Parathion

The concentration of parathion in an unfiltered water sample should not exceed 0.008

micrograms per litre for the protection of aquatic life.

Other Pesticides

The concentration of unspecified, non-persistent pesticides should not exceed 0.05 of the median lethal concentration on a 96-hour test for any sensitive local species.

(b) Other substances

Unspecified Non-Persistent Toxic Substances and Complex Effluents

Unspecified non-persistent toxic substances and complex effluents of municipal, industrial or other origin should not be present in concentrations which exceed 0.05 of the median lethal concentration in a 96-hour test for any sensitive local species to protect aquatic life.

Oil and Petrochemicals

Oil and petrochemicals should not be present in concentrations that:

(i) can be detected as visible film, sheen or discoloration on the surface;

(ii) can be detected by odour;

(iii) can cause tainting of edible aquatic organisms; and

(iv) can form deposits on shorelines and bottom sediments that are detectable by sight or odour, or are deleterious to resident aquatic organisms.

2. Inorganic Substances

Ammonia

The concentration of un-ionized ammonia (NH3) should not exceed 20 micrograms per litre for the protection of aquatic life. Concentrations of total ammonia should not exceed 500 micrograms per litre for the protection of public water supplies.

Hydrogen Sulfide

The concentration of undissociated hydrogen sulfide should not exceed 2.0 micrograms per litre to protect aquatic life.

C. **Other substances**

1. Dissolved oxygen

In the connecting channels and in the upper waters of the Lakes, the dissolved oxygen level should not be less than 6.0 milligrams per litre at any time; in hypolimnetic waters, it should be not less than necessary for the support of fishlife, particularly cold water species.

2. pH

Values of pH should not be outside the range of 6.5 to 9.0, nor should discharge change the pH at the boundary of a limited use zone more than 0.5 units from that of the ambient waters.

3. Nutrients

Phosphorus

The concentration should be limited to the extend necessary to prevent nuisance growths of algae, weeds and slimes that are or may become injurious to any beneficial water use. (Specific phosphorus control requirements are set out in Annex 3.)

4. Tainting Substances

(a) Raw public water supply sources should be essentially free from objectionable taste and odour for aesthetic reasons.

(b) Levels of phenolic compounds should not exceed 1.0 microgram per litre in public water

supplies to protect against taste and odour in domestic water.

(c) Substances entering the water as the result of human activity that cause tainting of edible aquatic organisms should not be present in concentrations which will lower the acceptability of these organisms as determined by organoleptic tests.

APPENDIX E: Baseline Water Quality Data Inventory and Analysis Reports Review

Summary of Baseline Water Quality Data Inventory and Analysis Reports
National Park Service Water Resources Division and Servicewide Inventory and Monitoring Program

Nine documents are archived at the Great Lakes Network office. These documents present the results of surface-water-quality data retrievals for the nine parks in the Great Lakes Network. They are one product of a cooperative contractual effort between the National Park Service's Servicewide Inventory and Monitoring Program; the National Park Service's Water Resources Division (WRD); and Horizon Systems Corporation, to retrieve, format, and analyze water quality data for all units of the National Park System containing significant water resources.

Data in the documents were retrieved from several databases for a "study area" around each park; each study area covered an area of three miles upstream to one mile downstream. The majority of data retrieved at each park appears to have resulted from one-time samplings by various agencies or intensive year-long studies before 1985. The locations of monitoring stations within each park that are considered to be long-term are noted. The number of long-term stations occurring varies among the parks.

The documents provide inventories of retrieved water quality data, stations, and entities responsible for data collection. Descriptive statistics, plots characterizing seasonal tendencies and trends, and a comparison of each park's water quality to the Environmental Protection Agency (EPA) and WRD water quality screening criteria are included. An Inventory Data Evaluation and Analysis (IDEA) to determine which Servicewide I&M Program Level I water quality parameters were measured in the study area is also included. Industrial/municipal discharges, drinking water intakes, impoundments, and active/inactive United States Geological Survey (USGS) gages are also mapped.

Each report notes parameters that exceeded screening criteria at least once. The data review by WRD acknowledges the impossibility of separating natural conditions from anthropogenic factors, including errors in the field and/or laboratory or recording procedures at this level of review. For example, are low dissolved oxygen values due to seasonal variations in low flow streams, lakes, or eutrophication induced by human activities? The final paragraph of the Executive Summary for each report notes overall conditions of the surface water resources in that study area.

The table below (Table E1) summarizes major findings of the reports for each park. In the column denoting parameters that exceeded criteria at least once, a '?' is intended to note that this parameter was exceeded very few times of the total observations or otherwise may not indicate a problem parameter at that park. A '!' is intended to note those parameters that exceeded criteria in 10% or more of observations and may indicate a problem parameter at that park. All other exceeded parameters would need to be looked at in more detail to determine severity of problem. Please note that drinking water criteria for human health were used to screen nitrate/nitrite results. The drinking water criteria are considerably higher than the USEPA's more recent Eco-Region Nutrient guidelines for ecological health. Therefore, the nutrient screening may be inadequate for ecological purposes.

TABLE E1. Summary of Baseline Water Quality Data Inventory and Analysis Reports for the Great Lakes Network Parks

Park	Technical report NPS/NRWRD/NRTR-year / #	Data date range	#Observations/ #parameters analyzed	Exceedances noted at least once in study area	Overall note
APIS	98/188 (March 1999)	1968 - 1996	20,681 / 479	DO, pH!, copper, indicator bacteria?, turbidity?, (low buffering capacity?)	SW generally appear to be of good quality N = spring runoff and erosion A = wastewater discharges, quarries, agriculture/forestry, water traffic, atmospheric. deposition, recreational use
GRPO	98/195 (March 1999)	1968 - 1995	2,578 / 173	Copper?, zinc, lead?, indicator bacteria?, turbidity?	SW generally appear to be good (note inadequate data) A = wastewater, runoff, mining, logging, recreation, atmospheric deposition
INDU	94/31 (October 1994)	1935 - 1992	165,608 / 743	DO, pH, cyanide, metals!, mercury, bis(2-ethylhexyl) phthalate?, nitrate, indicator bacteria!, turbidity!	SW have been impacted by A A = industrial and sewage effluents, runoff, atmospheric sulfur and nitrous oxides, altered hydrologic processes due to development
ISRO	95/41 (January 1995)	1962 - 1987	9,248 / 366	pH?, cadmium?, copper?, lead, zinc?, indicator bacteria	SW generally appears to be of very good quality with "minute impacts" from A
MISS	95/61 (August 1995)	1926-1994	273,531 / 803	DO!, pH, metals!, mercury, chloride, sulfate?, DDT?, nitrate, fluoride?, indicator bacteria!, turbidity	SW appear to be heavily impacted by A A = wastewater discharges, stormwater runoff, recreation, commercial/residential development
PIRO	95/57 (June 1995)	1968 - 1984	7,466 / 237	Cadmium, pH?, lead?, indicator bacteria?	SW generally appear to be of good quality A = development
SACN	95/69 (December 95)	1926-1995	113,022 / 628	DO!, pH, cyanide?, cadmium!, copper, lead!, mercury, silver?, zinc, nitrate, fluoride?, arsenic?, beryllium, nickel, indicator bacteria!, turbidity, alkalinity	SW have been impacted by human activities A = wastewater discharges, runoff, recreation, agriculture, forestry, development

TABLE E1 (continued)

Park	Technical report NPS/NRWRD/NRTR-year / #	Data date range	#Observations/ #parameters analyzed	Exceedances noted at least once in study area	Overall note
SLBE	97/106 (March 97)	1962 - 1996	51,317 / 294	DO!, pH, cadmium, copper, zinc, lead, indicator bacteria	SW generally appear to be of good quality A=wastewater, septic leakage, runoff, recreational use
VOYA	95/44 (January 95)	1967 - 1991	17,935 / 316	DO?, pH, alkalinity, zinc? cadmium, copper, lead, nickel?, indicator bacteria?	SW generally appear to be of good quality A = atmospheric deposition

? = Based on very few observations, few exceedances out of many observations, or questionable results.
! = Exceedances of greater than 10% total observations
SW = Surface water resources
N = potential natural impacts
A = potential anthropogenic impact sources